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EXAMINER

FINEMAN, LEE A

ART UNIT PAPER NUMBER

2872

DATE MAILED: 02 12 2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/899.481

Applicant(s)

LIU ET AL.

Examiner

Lee Fineman

Art Unit

2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 November 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 6-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-2, 6-15, and 18-20 is/are rejected.
- 7) ☒ Claim(s) 3, 4, 16 and 17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application)
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other _____

DETAILED ACTION

1. This Office Action is in response to an amendment filed 25 November 2002 in paper number 6 in which claims 2-4, 6-9, and 12-14 were amended, claim 5 was cancelled and claims 15-20 were added. Claims 1-4 and 6-20 are pending.

Claim Objections

2. Claim 4 is objected to because of the following informalities:

In claim 4, "said left-hand side," "said first ordinary beam," "said first extra-ordinary beam," "said right-hand side," "said second ordinary beam," "said second extra-ordinary beam," lack antecedent basis. The examiner suggests having claim 4 depend on claim 3 rather than claim 2. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 9-14 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The original disclosure fails to adequately support the recitations of "a loop optical circulator having N ports...where N is an integer of at least three" as set out in claim 9. The loop optical circulator originally disclosed supports only a four-port

circulator and does not include N ports where N is three or where N is five or more. The dependent claims inherit the deficiencies of the claims from which they depend.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(c) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claim 1 is rejected under 35 U.S.C. 102(b) as being clearly anticipated by Pattie.

International Publication Number, WO94/09400.

Pattie discloses a four-port loop optical circulator (figs. 1 and 4) comprising a first (2), a second (4), a third (6), and a fourth (8) optical ports for receiving an optical beam therein; and a plurality of optical components (figs. 1 and 4) for guiding a beam received from said first port to project from said second port, for guiding a beam received from said second port to project from said third port, for guiding a beam received from said third port to project from said fourth port, and for guiding a beam received from said fourth port to project from said first port (fig. 5).

6. Claims 1, 2, 6-8, 15, and 18-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Ducellier et al., U.S. Patent Application Publication Number, US 2002/0024730 A1.

Regarding claims 1, 2, and 15, Ducellier et al. discloses a four-port loop optical circulator (fig. 14) comprising a first (311), a second (312), a third (313), and a fourth (314) optical ports for receiving an optical beam therein; and a plurality of optical components (fig. 14) for guiding a beam received from said first port to project from said second port, for guiding a beam received from said second port to project from said third port, for guiding a beam received from said third port to project from said fourth port, and for guiding a beam received from said fourth port to project from said first port (page 2, section [0034]), a walk-off crystal for generating a vertical optical path displacement for a vertical polarized optical beam and for passing a horizontally polarized optical beam therethrough maintaining a same optical path (329b), a vertical displacement means (326) for shifting an optical path along a vertical direction with a predefined vertical displacement for an optical beam transmitted with a particular polarization (page 5, section [0064], lines 19-22), and wherein said vertical displacement means is coupled to said walk-off crystal for guiding a beam received from said fourth port to project from said first port (fig. 14) or wherein said vertical displacement means is adapted to transmit or receive said polarized beam from said walk-off crystal (fig. 14).

Regarding claims 6-8 and 18-20, Ducellier et al. further discloses said vertical displacement means comprising a polarized beam splitter (326-top) for reflecting an optical beam with said particular polarization substantially along a vertical direction generating said predefined vertical displacement (fig. 14), a right angle prism (326-bottom) disposed at said predefined vertical displacement away from said polarized beam splitter, said right angle prism reflecting said optical beam with said particular polarization projected from said polarized beam splitter for transmitting said optical beam with said particular polarization substantially along a

horizontal direction, and wherein said vertical displacement means further comprises a first set of half wave plates (328) for changing a state of polarization (SOP) of a beam by 90 degrees towards a first angular direction to a polarized beam splitter (PBS)-incident SOP to allow a beam to pass through or reflected from said PBS depending on said PBS-incident SOP then another set of half wave plates (327) to rotate said SOP of said beam by 90 degrees toward a second angular direction opposite to said first angular direction (page 5, section [0064], lines 22-25).

7. Claims 9 and 12 are rejected under 35 U.S.C. 102(a) as being anticipated by Ducellier et al., European Patent Application Publication Number, EP 00310410.6.

Ducellier et al. discloses a switchable optical loop circulator (fig. 6 and column 13, section [0046]) comprising N=4 ports, a K=1 port (P1), a K=2 port (P2), a K=3 port (P3), and a K=4 port (P4) and operable to guide a beam received for K=1 to K=2 to K=3, to N=4 to 1 (column 8, section [0023]) and an optical switching means (column 13, section [0046]) comprised of an electrically controlled half wave plate composed of liquid crystals, disposed in the path of the loop circulator for switching optical transmission paths of said loop circulator.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ducellier et al. in view of Shirasaki et al., US Patent No. 6,226,115 B1.

Ducellier et al. discloses the claimed invention except for the optical switching means further comprising an electrically controlled half wave plates composed of electro-optic materials. Shirasaki et al. teaches an optical circulator (fig. 2) and at least an optical switching means (214 and 218) for switching optical transmission paths of the loop optical circulator (column 3, lines 50-56) wherein the switching means further comprising electrically controlled half wave plates composed of either electro-optic material or liquid crystal (column 7, lines 7-9). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the optical switching means of Shirasaki et al. in the device of Ducellier et al. to provide more control over the rotation of the beam.

10. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ducellier et al. in view of Shirasaki et al., as applied to claim 11 above, and further in view of Bergmann et al., US Patent No. 6,002,512.

Ducellier et al. in view of Shirasaki et al., as applied to claim 11 above, discloses the optical switching means comprising Faraday rotators that are surrounded by an electromagnetic pulse means for controlling a rotation direction (Shirasaki, column 7, 18-23) but does not disclose the Faraday rotators being latched. Bergmann et al. teaches a set of latched Faraday rotators (16, 18). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to latch the Faraday rotators of Shirasaki et al. to reduce the number of components (Bergmann, column 1, lines 56-58).

11. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ducellier et al. in view of Riza, US Patent No. 6,282,336 B1.

Ducellier et al. discloses the claimed invention except for the optical switching means further comprising an electrically controlled in/out DOVE prism. Riza teaches an optical switching means (fig. 1b) with an electrically controlled in/out DOVE prism (column 3, lines 65-67). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the optical switching means of Riza in the circulator of Ducellier et al. to have fine beam alignment controls (Riza, column 3, lines 4-5).

12. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ducellier et al. in view of Riza, as applied to claim 14 above, and further in view of Jackel et al., US Patent No. 5,034,95.

Ducellier et al. in view of Riza, as applied to claim 14 above, discloses the claimed invention except for the electrically controlled prism being a rhomb prism. Jackel et al. teaches a loop optical circulator (column 1, lines 12-14) in so far as the laser beam loops through the system numerous times with an optical switching means comprising a rhomb prism (column 1, line 55). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the rhomb prism of Jackel et al. in the circulator of Ducellier et al. in view of Riza to simplify optical construction by preventing image rotation from reflection.

Allowable Subject Matter

13. Claims 3-4 and 16-17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

14. Claims 3-4 and 16-17 are allowable over the prior art for at least the reason that the prior art fails to teach and/or suggest “a vertical displacement means for shifting an optical path along a vertical direction with a predefined vertical displacement for an optical beam transmitted with a particular polarization” in combination with “a first birefringent crystal disposed on a left-hand side of said walk-off crystal for generating a first ordinary beam and a first extra-ordinary beam and a second birefringent crystal disposed on a right-hand side of said walk-off crystal for generating a second ordinary beam and a second extra-ordinary beam” or “a first polarization rotation means disposed on a left-hand side of said walk-off crystal for generating a first state of polarization for a first ordinary beam and a first extra-ordinary beam to project to said walk-off crystal and a second polarization rotation means disposed on a right-hand side of said walk-off crystal for generating a second SOP for a second ordinary beam and a second extra-ordinary beam to project to said walk-off crystal” as set forth in the claimed combination.

Ducellier et al. discloses a four-port loop optical circulator (fig. 14) comprising a walk-off crystal for generating a vertical optical path displacement for a vertical polarized optical beam and for passing a horizontally polarized optical beam therethrough maintaining a same optical path (329b) and a vertical displacement means (326) for shifting an optical path along a

vertical direction with a predefined vertical displacement for an optical beam transmitted with a particular polarization (page 5, section [0064], lines 19-22) but does not have a first birefringent crystal disposed on a left-hand side of said walk-off crystal for generating a first ordinary beam and a first extra-ordinary beam and a second birefringent crystal disposed on a right-hand side of said walk-off crystal for generating a second ordinary beam and a second extra-ordinary beam or a first polarization rotation means disposed on a left-hand side of said walk-off crystal for generating a first state of polarization for a first ordinary beam and a first extra-ordinary beam to project to said walk-off crystal and a second polarization rotation means disposed on a right-hand side of said walk-off crystal for generating a second SOP for a second ordinary beam and a second extra-ordinary beam to project to said walk-off crystal as claimed.

Response to Arguments

15. Applicant's arguments with respect to claims 1-14 have been considered but are moot in view of the new ground(s) of rejection.

16. It is noted by the Examiner that the claim objections and objections to the disclosure made in the previous Office Action have been withdrawn due to amendment.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lee Fineman whose telephone number is (703) 305-5414. The examiner can normally be reached on Monday - Friday 7:30 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cassandra Spyrou can be reached on (703) 308-1687. The fax phone numbers for the

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organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4900.

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LAF

February 6, 2003

Mark A. Robinson
MARK A. ROBINSON
PRIMARY EXAMINER